



US005914548A

United States Patent [19]

Watanabe et al.

[11] **Patent Number:** 5,914,548[45] **Date of Patent:** Jun. 22, 1999[54] **SEALED ACTUATOR**[75] Inventors: Hayao Watanabe; Atsushi Horikoshi,
both of Gunma, Japan

[73] Assignee: NSK Ltd., Tokyo, Japan

[21] Appl. No.: 08/773,180

[22] Filed: Dec. 27, 1996

[30] **Foreign Application Priority Data**Dec. 28, 1995 [JP] Japan 7-343805
Dec. 25, 1996 [JP] Japan 8-355764[51] Int. Cl.⁶ H02K 5/10; H02K 11/00;
H02K 7/20

[52] U.S. Cl. 310/88; 310/68 B; 310/112

[58] Field of Search 310/68 B, 84,
310/86, 88, 89, 112, 114[56] **References Cited****U.S. PATENT DOCUMENTS**2,669,667 2/1954 Haines 310/40
2,809,310 10/1957 Dunn et al. 310/86
2,993,131 7/1961 Trevitt 310/86
3,686,556 8/1972 Anger et al. 318/595
4,893,078 1/1990 Auchterlonie 318/660
5,270,600 12/1993 Hashimoto 310/75
5,291,087 3/1994 Pollick et al. 310/86
5,394,043 2/1995 Hsai 310/885,446,966 9/1995 Ishizaki 318/605
5,469,035 11/1995 Lowrance 318/568.1
5,641,276 6/1997 Heidelberg et al. 417/423.7**FOREIGN PATENT DOCUMENTS**3-150041 6/1991 Japan H02K 5/12
3-150042 6/1991 Japan H02K 5/12
WO 94/23911 10/1994 WIPO B25J 21/00*Primary Examiner*—Clayton LaBalle*Attorney, Agent, or Firm*—Sughrue, Mion, Zinn, Macpeak
& Seas, PLLC[57] **ABSTRACT**

A sealed actuator includes a motor stator having rotation-drive magnetic poles; a motor rotor arranged so as to confront magnetic pole surfaces of the motor stator while interposing a small distance therebetween and rotatably supported through roller bearings; and displacement detecting means for measuring displacement of the motor rotor. A partition wall made of a nonmagnetic metal is disposed in a clearance between the motor stator and the motor rotor, so that the inner space where the motor stator is disposed is hermetically covered. The bearings are disposed at both sides of the partition wall in the axial direction so that the load applied to the bearings are directly received by a housing. At least a part of the partition wall is reinforced by reinforcing members and a mold agent is charged into the space on the motor stator side.

24 Claims, 7 Drawing Sheets